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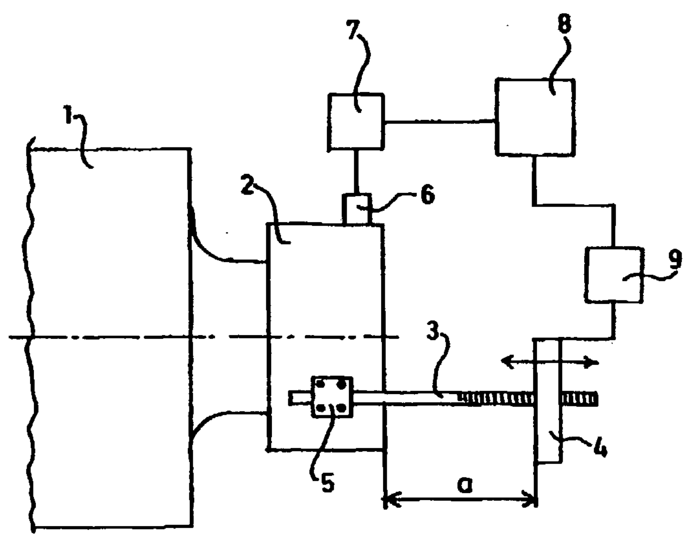

(57) Abstract

The invention relates to a method for damping vibration in a paper machine or in a paper finishing device by means of a dynamic damper which comprises an additional weight suspended from a vibrating object by means of a spring. In the method, the spring constant of the spring (3) of the dynamic damper and/or the mass (4) of the dynamic damper is/are changed by means of a control device (9) in order to tune the natural frequency of the dynamic damper. In an advantageous application of the invention, the vibration induced by rolls (1) which are in nip contact is damped by means of the damper so that the damper is tuned to a frequency that is substantially equal to a multiple of the rotational frequency of the roll that is closest to the natural frequency of the vibrating system. The invention also relates to an apparatus.

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Method and equipment for attenuation of oscillation in a paper machine or in a paper finishing device

The invention relates to a method and an apparatus for damping vibration in a paper machine or in a paper finishing device by means of a dynamic damper which comprises an additional weight suspended from a vibrating system by means of a spring.

In paper machines and in paper finishing devices, vibrations constitute a major problem and, in present-day systems, when attempts are being made to achieve ever higher speeds, the vibration problems have become still more apparent than before. There are several possible sources of vibration in paper machines, and some of the most significant of them are rolls and cylinders, which comprise a very great mass revolving at a considerable speed. It is clear, of course, that when rolls are manufactured, attempts are being made to make their measurement precision as good as possible and, in addition, they are balanced in order to eliminate the vibrations.

However, present-day paper machines and paper finishing devices increasingly employ rolls provided with a soft coating, which rolls in operation may form a very significant source of vibration. Such rolls are used, for example, in on-line and off-line calenders, coating machines, size presses, supercalenders and equivalent, where said roll provided with a soft coating forms a nip with another roll. A paper web and possibly a felt, wire or equivalent is passed through the nip. When in this kind of nip roll arrangement, the seam of the wire, felt or web, considerable impurities or something else causing a noticeable change in the thickness of the web travelling through the nip, passes/pass through the nip during running, the coating must yield elastically, with the result that the coating serves as a spring that excites vibration. For example, in a size press and in a coating device of the size press type, the nip is defined by means of two rolls such that one nip roll is mounted by means of bearing housings directly on the frame structure of said device, while the opposite

roll is mounted at its bearing housings on loading arms that are attached by means of articulated joints to the frame structure of the machine. In that case, the roll mounted on the loading arms in particular begins to vibrate, in which connection the coating of the soft-faced roll is deformed, with the result that the vibration increases and the roll begins to resonate. Until now, it has been necessary to take care of and to eliminate such vibrations so that, by changing the running speed of the machine, such a running speed has been sought that, at said running speed, the vibration does not grow any stronger but begins to be attenuated. The vibration problems have prevented the use of certain speeds.

An object of the present invention is to provide a novel method and apparatus for damping vibrations that are being created such that the vibration can be damped by means of said method and apparatus without changing the running speed. The invention is based on the use of a dynamic damper, and the method in accordance with the invention is mainly characterized in that, in the method, the spring constant of a spring of the dynamic damper and/or the mass of the dynamic damper is/are changed by means of a control device in order to tune the natural frequency of the dynamic damper.

The apparatus in accordance with the invention is, in turn, characterized in that the apparatus comprises a control device which is arranged to change the spring constant of a spring of a dynamic damper and/or the mass of the dynamic damper in order to tune the natural frequency of the dynamic damper.

In an advantageous application of the invention, the vibration induced by rolls that are in nip contact is damped by means of the dynamic damper such that the damper is tuned to a frequency that is substantially equal to a multiple of the rotational frequency of the roll that is closest to the natural frequency of the vibrating system. The dynamic damper can also be tuned substantially directly to a frequency that corresponds to the problematic excitation frequency of a vibrating system.

In one advantageous embodiment of the invention, in the method, the vibration frequencies of a vibrating system are measured constantly by means of one or more vibration detectors, the measurement signals given by the vibration detector are amplified by means of an amplifier and fed into a vibration analyser which identifies the problematic excitation frequency and converts said problematic excitation frequency into a control signal which is fed into a control device in order to tune the dynamic damper.

In one application of the invention, the spring of the dynamic damper is a rod fixed at one end thereof to a vibrating system, such as, for example, a bearing housing of a roll, in a substantially horizontal direction, on support of which rod an additional weight is mounted. In that case, the control device may be arranged to change the spring constant of the spring of the dynamic damper by changing the position of the additional weight on said rod.

Preferably, a locking means is fitted on the rod serving as the spring of the damper in order to lock the additional weight in place after the tuning frequency of the damper has been made as desired. The rod and the additional weight disposed on the rod may be provided with threads fitting each other so that the position of the additional weight on the rod may be adjusted by rotating said additional weight on the rod. In this kind of arrangement, the locking means is arranged to act in the axial direction of the rod and to produce an axial force acting on the additional weight in order to provide a frictional force necessary for locking between the matching threads on the rod and on the additional weight.

The locking means is preferably a pneumatically operated piston device which is fixed on the rod and which is telescopic in order to provide the necessary stroke length.

In one embodiment of the invention, the additional weight included in the dynamic damper comprises a container suspended from the spring and filled with a liquid, the amount of the liquid in said container being adjustable in order to regulate the mass.

In that connection, the control device is connected, for example, to a pump and a valve in order to regulate the amount of the liquid.

In one embodiment of the invention, the rod serving as the spring of the dynamic damper is made of memory metal. In this case, the natural frequency of the damper is arranged to be tuned by regulating the temperature of the rod made of a memory metal material by means of electric resistors or equivalent heaters. In this kind of embodiment of the invention, the additional weight can be attached to the rod rigidly and without a clearance, thereby providing a simpler construction in this respect.

The invention provides a significant advantage over prior art especially in that vibration is damped by means of the method and the apparatus in accordance with the invention without changing the running speed of the machine. A substantial and significant advantage is also that the apparatus is very simple in its construction and in its mode of implementation and that it can be connected by very simple operations to existing structures for the purpose of damping vibrations. The further advantages and characteristic features of the invention will become apparent from the following detailed description of the invention.

In the following, the invention will be described by way of example with reference to the figures in the accompanying drawing.

Figure 1 schematically depicts a size press or a coating machine of the size press type to which the apparatus in accordance with the invention can be applied.

Figure 2 shows in schematic form one example of the apparatus in accordance with the invention.

Figure 3 is a fully schematic illustration of an advantageous mode of tuning a damper.

Figure 4 is an illustration corresponding to that of Fig. 2 of another example of the apparatus in accordance with the invention.

Figure 5 shows a further embodiment example of the apparatus.

Figure 6 shows an embodiment of the invention in which a special locking means is used for an additional weight of a damper.

Figures 7A and 7B are more detailed sectional views of the locking means shown in Fig. 6.

Figure 8 is finally a schematic view of a damper in which a memory metal material is used in the spring of the damper.

Fig. 1 has been included merely to illustrate one possible application of the invention and, thus, Fig. 1 shows a size press or equivalent, which is generally denoted with the reference numeral 10. The size press 10 comprises a frame 14 on which a first size press roll 11 has been mounted directly by means of bearing housings 12. In the illustration of Fig. 1, said roll 11 is provided with a soft roll coating 13. Loading arms 16 have been mounted pivotally on the frame 14 of the size press by means of a pivot shaft 15 extending in the cross direction of the machine, on support of which loading arms a second roll 1 defining a nip N with the first roll 11 has been mounted at its bearing housings 2. For the purpose of providing a desired linear load in the nip N, the loading arms 16 are loaded by means of hydraulic cylinders 17, by whose means the nip N may also be opened. The reference signs 18 and 19 designate coating units by whose means a coating material, such as size, pigment coating material or equivalent is applied to the surface of the rolls. In a normal way, a web W is passed through the nip N.

When a seam or some other equivalent thicker part travels through the nip N in the size press shown in Fig. 1, the coating 13 is deformed and it functions as a spring, with the result that the apparatus, in particular the roll 1 pivotally mounted on the

frame 14, begins to vibrate. Vibration deforms the roll coating 13 further, whereupon the vibration is intensified and the roll 1 is brought to a resonating state. In conventional arrangements, this has led to the fact that it has been necessary to change the running speed because it has not been possible to dampen the vibration otherwise. In the invention, however, the damping of vibration has been taken care of such that a dynamic damper that is automatically tuned in accordance with the invention is mounted on the bearing housing 2 of the vibrating roll 1, which damper is illustrated in more detail in Fig. 2 of the drawing.

As shown in Fig. 2, the apparatus in accordance with the invention is in its principle very simple. In principle, the invention is constituted by a dynamic damper known per se and fitted on a vibrating system, i.e. in this case on the bearing housing 2 of the roll 1, which damper comprises a mass 4 suspended from the vibrating system 2 by means of a spring 3. In the illustration of Fig. 2, the spring is a rod 3 rigidly fitted on the bearing housing 2 by means of attachment members 5, which rod is additionally provided with threads in the example of the figure. As the mass serves a weight 4 which is fitted on the rod 3 and which can be displaced by means of the threads in the longitudinal direction of the rod 3 such that the distance a of the weight 4 from the bearing housing 2 can be regulated. As already stated once above, the damper is thus a dynamic damper known per se. The basic equation of dimensioning the dynamic damper is simply:

$k/m = \Omega^2$ where k = the spring constant of the spring, i.e. the rod 3 in this case, m = the mass of the weight 4, and Ω = the angular velocity of the vibrating system, i.e. the bearing housing 2.

The effect of the dynamic damper is based in one advantageous embodiment of the invention on the fact that the natural frequency of said damper is tuned so as to be equal to the problematic excitation frequency. In this connection, it shall be pointed out that there may be several problematic excitation frequencies that differ from one another, but in one example which employs a coating machine of the size press type like the one shown in Fig. 1 there was a so-called lower problem frequency, in which the motion of bearing housings was large, of the order of about 50 Hz. Since

the effective damping capacity of the dynamic damper is, however, limited to a relatively narrow frequency band, it is clear that it must be possible to regulate the natural frequency of the damper. As it is commonly known that, for example, in the case shown in Fig. 2, the spring constant k of the rod 3 is inversely proportional to the power of three of the length of the rod, it is easy to regulate the natural frequency of the damper by adjusting the distance a of the weight 4 from the bearing housing 2. When the natural frequency of the damper has been made equal to the problematic excitation frequency by changing the distance a, the bearing housing 2 ceases to vibrate and the weight 4 resting on support of the rod 3 begins to vibrate, respectively. This means that the arrangement formed by means of an additional spring, i.e. the rod 3, and an additional weight, i.e. the weight 4, produces a force that is in an opposite phase and of equal magnitude to the excitation, whereby the vibration of the machine itself ceases.

As already stated above, a vibrating system or an equivalent object may have several problematic excitation frequencies because, depending on the system, it may include several devices which vibrate at different frequencies. For example, in the size press arrangement described previously, a significant source of vibration in the system is a vibrating roll. In this kind of example, the natural frequency of the vibrating system is not necessarily equal to a multiple of the rotational frequency of the roll inducing the vibration (in most instances this is not the case). In that connection, a very effective way of damping the vibrations of the system is that the damper, for example, a damper of the kind illustrated in Fig. 2, is tuned to a frequency which corresponds to a multiple of the rotational frequency of the roll that is closest to the natural frequency of the vibrating system. This multiple of the rotational frequency is thus used as the tuning frequency of the damper. This is illustrated fully schematically in Fig. 3, which shows the relation between the natural frequency of a vibrating system and multiples of the rotational frequency of a roll in a frequency/amplitude coordinate system.

If the device in question were a device that is operated continuously at a constant speed, the vibrations could be brought under control merely by tuning the natural

frequency of the dynamic damper once to a correct level. However, in the paper machine application, the running speeds and thus the vibration frequencies too vary. Consequently, it must be possible to regulate the dynamic damper fairly precisely. In the inventive arrangement shown in Fig. 2, adjustability is provided such that the bearing housing 2 whose vibration is desired to be damped is provided with a vibration detector 6. The vibration detector 6 transmits a signal that is amplified by an amplifier 7 and passed further to a computer 8 serving as a vibration analyser, which filters and analyses the vibration frequencies and locates the problematic excitation frequency among the frequencies and converts it into a control signal and transmits said control signal to a control device 9 which moves the weight 4 on the rod 3. The control device 9 is advantageously, for example, a stepping motor. The apparatus thus comprises a closed control circuit that constantly measures and analyses vibrations and, based on this, regulates the natural frequency of the dynamic damper.

The illustration of Fig. 4 corresponds to that of Fig. 2 so that this example also uses a vibration detector 6 that measures and identifies the vibrations of a bearing housing 2 and transmits in accordance therewith a signal that is amplified by an amplifier 7 and passed further to a vibration analyser 8. The vibration analyser 8 converts the problematic excitation frequency it has found from the vibration frequencies analysed by it into a control signal and transmits it to a control device 9. The dynamic damper differs in this example from the one described previously such that the damper comprises a spring 3a which is suspended from the bearing housing 2 and from which a weight 4a is suspended whose mass can be changed. The spring 3a itself is here constant in length. The weight 4a comprises, for example, as shown in Fig. 3, a container and a liquid in said container, the amount of said liquid being regulated by means of a pump 21 and a valve 22. The container is denoted with the reference sign 23. The control device 9 thus controls said pump 21 and valve 22 based on the control signal received by it in order to change the amount of the liquid in the container of the weight 4a.

Fig. 5 shows a further embodiment of the invention which differs from the ones described previously. In this embodiment, the spring 3b of the dynamic damper comprises a rod that is mounted and attached to a bearing housing 2 in a way corresponding to the illustration of Fig. 2. The weight 4b of the damper in turn corresponds in structure and in operation to the illustration of Fig. 3 so that it comprises a container and a liquid therein whose amount is regulated by means of a pump 21 and a valve 22. In the illustration of Fig. 5, the weight 4b is, however, suspended from the spring 3b such that its distance a from the bearing housing 2 can be changed, for example, in a way corresponding to that shown in Fig. 2. Accordingly, both the distance a of the weight 4b from the bearing housing 2 and the mass of the weight 4b are regulated in the illustration of Fig. 5.

Fig. 6 shows an embodiment of the apparatus in accordance with the invention which is provided with a locking means 30 by whose means an additional weight 4 can be locked in place on the rod 3. In accordance with the embodiments described above, the rod 3 serving as the spring of the dynamic damper is attached to a vibrating system 2, such as, for example, a bearing housing by means of suitable attachment members 5. Fig. 6 further shows that the rod 3 is provided with threads 3' and, in a similar way, the additional weight is provided with threads matching said threads 3' so that said additional weight may be moved on the rod 3 by rotating, i.e. by "screwing". Once the additional weight 4 has been brought to a correct place on the rod 3, it is locked in place by means of the locking means 30, which produces a force in the axial direction of the rod 3 in order to provide a frictional force necessary for locking between the rod 3 and the additional weight 4. As shown in Fig. 6, the locking means 30 is preferably attached to a free outer end of the rod 3. In Fig. 6, the locking means 30 is shown in a free position, in which connection the additional weight 4 can be moved by rotating on the rod 3. The structure and operation of the locking means 30 is illustrated in more detail in schematic sectional views 7A and 7B.

Figs. 7A and 7B thus show the structure of the locking means 30 in more detail. Fig. 7A shows the locking means 30 in a free position corresponding to that of Fig.

6 and, correspondingly, in Fig. 7B, the locking means 30 is shown in a locking position. The locking means 30 comprises a cylindrical casing 31 which confines within it a cavity that serves as a pressure space 32. A piston 33 is disposed in this pressure space 32 and sealed by means of seals against the inner wall of the casing 31, said piston 33 being telescopic in the illustrated embodiment comprising telescopic parts 34. The piston 33 is attached to the rod 3, preferably in the fashion shown in Figs. 7A and 7B to the outer end of the rod 3 immovably, and the cylindrical casing 31 of the locking means 30 is thus fitted axially movably on the piston 33 and on the rod 3. The piston 33 divides the pressure space 32 in the axial direction in two parts, which are both provided with a connecting member 36, 37 for feeding in a pressure medium. Compressed air is preferably used as the pressure medium. Depending on the side of the piston 33 into which the pressure medium is passed, the locking means is brought either to the free position shown in Fig. 7A or to the locking position shown in Fig. 7B. In the locking position, the casing 31 of the locking means 30 has been displaced so that the end face 35 of the casing facing the additional weight 4 lies against said additional weight. The additional weight 4 is shown in Figs. 7A and 7B only partially and schematically. When the pressure medium is conducted through the connecting member 37 into the pressure space of the locking means 30, an axial force needed for locking is produced, which force provides a frictional force of required magnitude between the thread 3' on the rod 3 and the matching thread on the additional weight 4.

Finally, Fig. 8 shows fully schematically an alternative of the invention where the spring of the dynamic damper, i.e. the rod 3, is made of memory metal. The coefficient of elasticity of memory metal is highly dependent on temperature. In that case, the natural frequency of the damper can be tuned to a right level by regulating the temperature of the rod 3. Regulation of temperature can be performed, for example, by means of electric resistors or equivalent heaters. In this kind of arrangement, an additional weight 4 can be attached to the rod 3 totally rigidly and without a clearance, for example, by welding. The structure may thus be made fairly simple. Regarding memory metals, it may be stated that they are alloys of different metals, of which an alloy of nickel and titanium may be mentioned as one example.

The properties of such an alloy may be regulated by introducing into it a sufficient amount of energy in the form of heating, with the result that the crystal structure of the metal alloy can be changed by this introduction of additional energy. Memory metal "remembers" the change which a certain heating operation brings about in the metal alloy.

It is also conceivable that the dynamic damper is applied in connection with hollow tubular rolls, for example, such that the dynamic damper is disposed inside a roll tube. In this case, the dynamic damper might comprise two or more springs which are fixed to the inner surface of the roll tube while the weight of the dynamic damper is fixed on support of said springs. However, it may be considered that it is more difficult to provide adjustability for this kind of damper than in the examples described previously.

The invention has been described above in connection with a size press and a coating machine of the size press type in particular. However, problems of the similar type are also encountered, inter alia, in soft calenders and in supercalenders, and the apparatus in accordance with the invention may also be applied to them. The problematic excitation frequencies differ, however, in these applications both from one another and from the arrangement shown in Fig. 1.

Above, the invention has been described by way of example with reference to the figures in the accompanying drawing. The invention is, however, not confined to relating only to the examples illustrated in the figures, but different embodiments of the invention may vary within the scope of the inventive idea defined in the accompanying claims.

Claims

1. A method for damping vibration in a paper machine or in a paper finishing device by means of a dynamic damper which comprises an additional weight suspended from a vibrating system by means of a spring, **characterized** in that, in the method, the spring constant of the spring (3,3b) of the dynamic damper and/or the mass (4a, 4b) of the dynamic damper is/are changed by means of a control device (9) in order to tune the natural frequency of the dynamic damper.

2. A method as claimed in claim 1, **characterized** in that the vibration induced by rolls (1, 11) which are in nip contact is damped by means of the dynamic damper so that the damper is tuned to a frequency that is substantially equal to a multiple of the rotational frequency of the roll that is closest to the natural frequency of the vibrating system.

3. A method as claimed in claim 1, **characterized** in that the dynamic damper is tuned to a frequency that substantially corresponds to the problematic excitation frequency of the vibrating system.

4. A method as claimed in any one of the preceding claims, **characterized** in that, in the method, the vibration frequencies of the vibrating system (2) are measured constantly by means of one or more vibration detectors (6), the measurement signals given by the vibration detector (6) are amplified by means of an amplifier (7) and fed into a vibration analyser (8), which identifies the problematic excitation frequency and converts said problematic excitation frequency into a control signal, which is fed into a control device (9) in order to tune the dynamic damper.

5. A method as claimed in any one of the preceding claims wherein the spring of the dynamic damper is a rod (3) attached at one end thereof to the vibrating object, **characterized** in that the spring constant is changed by changing the position of the additional weight (4) on the rod (3).

6. A method as claimed in claim 5, **characterized** in that when the tuning frequency of the dynamic damper has been made as desired, the additional weight (4) is locked in place on the rod (3) by means of a locking means (30).

7. A method as claimed in claim 6, **characterized** in that the locking means (30) is operated by means of compressed air.

8. A method as claimed in any one of claims 1 to 4, **characterized** in that a rod (3) made of memory metal is used as the spring of the dynamic damper.

9. A method as claimed in claim 8, **characterized** in that the natural frequency of the damper is tuned to a correct level by regulating the temperature of the rod made of a memory metal material.

10. A method as claimed in claim 9, **characterized** in that the temperature of the rod is regulated by means of electric resistors or equivalent heaters.

11. An apparatus for damping vibration in a paper machine or in a paper finishing device by means of a dynamic damper which comprises an additional weight (4, 4a, 4b) suspended from a vibrating system (2) by means of a spring (3,3a,3b), **characterized** in that the apparatus comprises a control device (9) which is arranged to change the spring constant of the spring (3, 3b) of the dynamic damper and/or the mass (4a, 4b) of the dynamic damper in order to tune the natural frequency of the dynamic damper.

12. An apparatus as claimed in claim 11, **characterized** in that the apparatus is fitted to dampen the vibration induced by rolls (1,11) forming a nip such that the control device (9) is arranged to tune the damper to a frequency that is substantially equal to a multiple of the rotational frequency of the roll that is closest to the natural frequency of the vibrating system.

13. An apparatus as claimed in claim 11, **characterized** in that the control device (9) is arranged to tune the damper to a frequency that substantially corresponds to the problematic excitation frequency of the vibrating system.

14. An apparatus as claimed in any one of claims 11 to 13, **characterized** in that the apparatus comprises one or more vibration detectors (6) which measure(s) the vibration frequencies of the vibrating system (2) constantly and which is/are arranged to transmit a measurement signal, an amplifier (7) that amplifies the measurement signal, a vibration analyser (8) which is arranged to receive the measurement signal transmitted by the vibration detector (6) and amplified by the amplifier (7), to identify the problematic excitation frequency from said signal and to convert said problematic excitation frequency into a control signal to be fed into the control device (9) in order to tune the dynamic damper.

15. An apparatus as claimed in any one of claims 11 to 14, **characterized** in that the spring (3, 3b) of the dynamic damper is a rod fixed at one end thereof to the vibrating system (2) in a substantially horizontal direction, on support of which rod the additional weight (4,4b) is mounted, and that the control device (9) is arranged to change the spring constant of the spring (3,3b) of the dynamic damper by changing the position of the additional weight (4,4b) on the rod (3,3b).

16. An apparatus as claimed in claim 15, **characterized** in that a locking means (30) is mounted on the rod (3) serving as the spring of the damper in order to lock the additional weight (4) in place when the tuning frequency of the damper has been made as desired.

17. An apparatus as claimed in claim 15 or 16, **characterized** in that the rod (3) and the additional weight (4) fitted on the rod are provided with matching threads (3'), and that the position of the additional weight (4) on the rod (3) can be regulated by rotating said additional weight on the rod.

18. An apparatus as claimed in claim 17, **characterized** in that the locking means (30) is arranged to act in the axial direction of the rod (3) and to produce an axial force acting on the additional weight (4) in order to provide a frictional force necessary for locking between the matching threads on the rod (3) and on the additional weight (4).

19. An apparatus as claimed in any one of claims 16 to 18, **characterized** in that the locking means (30) is a piston device fixed onto the rod.

20. An apparatus as claimed in claim 19, **characterized** in that the piston device (30) is telescopic in order to provide the necessary stroke length.

21. An apparatus as claimed in any one of claims 16 to 20, **characterized** in that the locking means (30) is operated by compressed air.

22. An apparatus as claimed in any one of claims 11 to 21, **characterized** in that the additional weight (4a,4b) included in the dynamic damper comprises a container suspended from the spring (3a,3b) and filled with a liquid, the amount of the liquid in said container being adjustable in order to regulate the mass.

23. An apparatus as claimed in claim 22, **characterized** in that the control device (9) is connected to a pump (21) and to a valve (22) in order to regulate the amount of the liquid.

24. An apparatus as claimed in any one of claims 11 to 23, **characterized** in that the control device (9) comprises a stepping motor or equivalent in order to change the location of the mass of the dynamic damper.

25. An apparatus as claimed in any one of claims 11 to 24, **characterized** in that the apparatus is fitted so as to dampen vibration in a nip in which at least one of the rolls forming the nip is provided with a soft coating (9).

26. An apparatus as claimed in any one of claims 11 to 25, **characterized** in that the dynamic damper and the vibration detectors (6) are fitted and fixed to the bearing housing (2) of the roll.

27. An apparatus as claimed in any one of claims 11 to 14, 25 to 26, **characterized** in that the spring of the dynamic damper is a rod (3) made of memory metal.

28. An apparatus as claimed in claim 27, **characterized** in that the natural frequency of the damper is arranged to be tuned by regulating the temperature of the rod made of a memory metal material.

29. An apparatus as claimed in claim 28, **characterized** in that, in order to regulate the temperature of the rod, the apparatus is provided with electric resistors or equivalent heaters.

30. An apparatus as claimed in any one of claims 27 to 29, **characterized** in that the additional weight (4) is fixed to the rod (3) rigidly and without a clearance.

AMENDED CLAIMS

[received by the International Bureau on 29 September 1998 (29.09.98); original claims 1-30 replaced by new claims 1-26 (5 pages)]

1. A method for damping vibration induced by rolls forming a nip in a paper machine or in a paper finishing device by means of a dynamic damper which comprises an additional weight suspended from a vibrating system by means of a spring, whereby in the method, the spring constant of the spring (3,3b) of the dynamic damper and/or the mass (4a, 4b) of the dynamic damper is/are changed by means of a control device (9) in order to tune the natural frequency of the dynamic damper, **characterized** in that the vibration induced by rolls (1, 11) which are in nip contact is damped by means of the dynamic damper so that the damper is tuned to a frequency that is substantially equal to a multiple of the rotational frequency of the roll that is closest to the natural frequency of the vibrating system, or to a frequency that substantially corresponds to the problematic excitation frequency of the vibrating system.

2. A method as claimed in claim 1, **characterized** in that, in the method, the vibration frequencies of the vibrating system (2) are measured constantly by means of one or more vibration detectors (6), the measurement signals given by the vibration detector (6) are amplified by means of an amplifier (7) and fed into a vibration analyser (8), which identifies the problematic excitation frequency and converts said problematic excitation frequency into a control signal, which is fed into a control device (9) in order to tune the dynamic damper.

3. A method as claimed in claim 1 or 2 wherein the spring of the dynamic damper is a rod (3) attached at one end thereof to the vibrating object, **characterized** in that the spring constant is changed by changing the position of the additional weight (4) on the rod (3).

4. A method as claimed in claim 3, **characterized** in that when the tuning frequency of the dynamic damper has been made as desired, the additional weight (4) is locked in place on the rod (3) by means of a locking means (30).

5. A method as claimed in claim 4, **characterized** in that the locking means (30) is operated by means of compressed air.

6. A method as claimed in claim 1 or 2, **characterized** in that a rod (3) made of memory metal is used as the spring of the dynamic damper.

7. A method as claimed in claim 6, **characterized** in that the natural frequency of the damper is tuned to a correct level by regulating the temperature of the rod made of a memory metal material.

8. A method as claimed in claim 7, **characterized** in that the temperature of the rod is regulated by means of electric resistors or equivalent heaters.

9. An apparatus for damping vibration induced by rolls forming a nip in a paper machine or in a paper finishing device by means of a dynamic damper which comprises an additional weight (4, 4a, 4b) suspended from a vibrating system (2) by means of a spring (3,3a,3b), said apparatus further comprising a control device (9) which is arranged to change the spring constant of the spring (3, 3b) of the dynamic damper and/or the mass (4a, 4b) of the dynamic damper in order to tune the natural frequency of the dynamic damper, **characterized** in that the apparatus is fitted to dampen the vibration induced by rolls (1,11) forming a nip such that the control device (9) is arranged to tune the damper to a frequency that is substantially equal to a multiple of the rotational frequency of the roll that is closest to the natural frequency of the vibrating system, or to a frequency that substantially corresponds to the problematic excitation frequency of the vibrating system.

10. An apparatus as claimed in claim 9, **characterized** in that the apparatus comprises one or more vibration detectors (6) which measure(s) the vibration frequencies of the vibrating system (2) constantly and which is/are arranged to transmit a measurement signal, an amplifier (7) that amplifies the measurement signal, a vibration analyser (8) which is arranged to receive the measurement signal transmitted by the vibration detector (6) and amplified by the amplifier (7), to

identify the problematic excitation frequency from said signal and to convert said problematic excitation frequency into a control signal to be fed into the control device (9) in order to tune the dynamic damper.

11. An apparatus as claimed in claim 9 or 10, **characterized** in that the spring (3, 3b) of the dynamic damper is a rod fixed at one end thereof to the vibrating system (2) in a substantially horizontal direction, on support of which rod the additional weight (4,4b) is mounted, and that the control device (9) is arranged to change the spring constant of the spring (3,3b) of the dynamic damper by changing the position of the additional weight (4,4b) on the rod (3,3b).

12. An apparatus as claimed in claim 11, **characterized** in that a locking means (30) is mounted on the rod (3) serving as the spring of the damper in order to lock the additional weight (4) in place when the tuning frequency of the damper has been made as desired.

13. An apparatus as claimed in claim 11 or 12, **characterized** in that the rod (3) and the additional weight (4) fitted on the rod are provided with matching threads (3'), and that the position of the additional weight (4) on the rod (3) can be regulated by rotating said additional weight on the rod.

14. An apparatus as claimed in claim 13, **characterized** in that the locking means (30) is arranged to act in the axial direction of the rod (3) and to produce an axial force acting on the additional weight (4) in order to provide a frictional force necessary for locking between the matching threads on the rod (3) and on the additional weight (4).

15. An apparatus as claimed in any one of claims 12 to 14, **characterized** in that the locking means (30) is a piston device fixed onto the rod.

16. An apparatus as claimed in claim 15, **characterized** in that the piston device (30) is telescopic in order to provide the necessary stroke length.

17. An apparatus as claimed in any one of claims 12 to 16, **characterized** in that the locking means (30) is operated by compressed air.

18. An apparatus as claimed in any one of claims 9 to 17, **characterized** in that the additional weight (4a,4b) included in the dynamic damper comprises a container suspended from the spring (3a,3b) and filled with a liquid, the amount of the liquid in said container being adjustable in order to regulate the mass.

19. An apparatus as claimed in claim 18, **characterized** in that the control device (9) is connected to a pump (21) and to a valve (22) in order to regulate the amount of the liquid.

20. An apparatus as claimed in any one of claims 9 to 19, **characterized** in that the control device (9) comprises a stepping motor or equivalent in order to change the location of the mass of the dynamic damper.

21. An apparatus as claimed in any one of claims 9 to 20, **characterized** in that the apparatus is fitted so as to dampen vibration in a nip in which at least one of the rolls forming the nip is provided with a soft coating (9).

22. An apparatus as claimed in any one of claims 9 to 21, **characterized** in that the dynamic damper and the vibration detectors (6) are fitted and fixed to the bearing housing (2) of the roll.

23. An apparatus as claimed in any one of claims 9, 10, 21 or 22, **characterized** in that the spring of the dynamic damper is a rod (3) made of memory metal.

24. An apparatus as claimed in claim 23, **characterized** in that the natural frequency of the damper is arranged to be tuned by regulating the temperature of the rod made of a memory metal material.

25. An apparatus as claimed in claim 24, **characterized** in that, in order to regulate the temperature of the rod, the apparatus is provided with electric resistors or equivalent heaters.

26. An apparatus as claimed in any one of claims 23 to 25, **characterized** in that the additional weight (4) is fixed to the rod (3) rigidly and without a clearance.

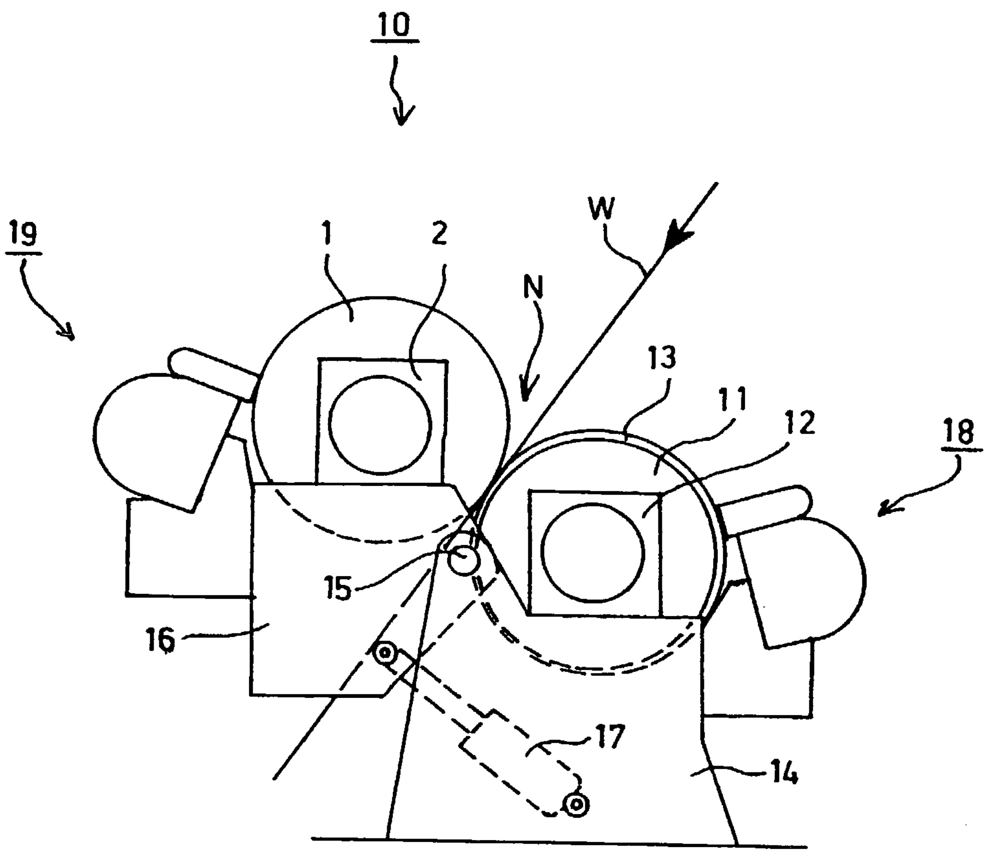
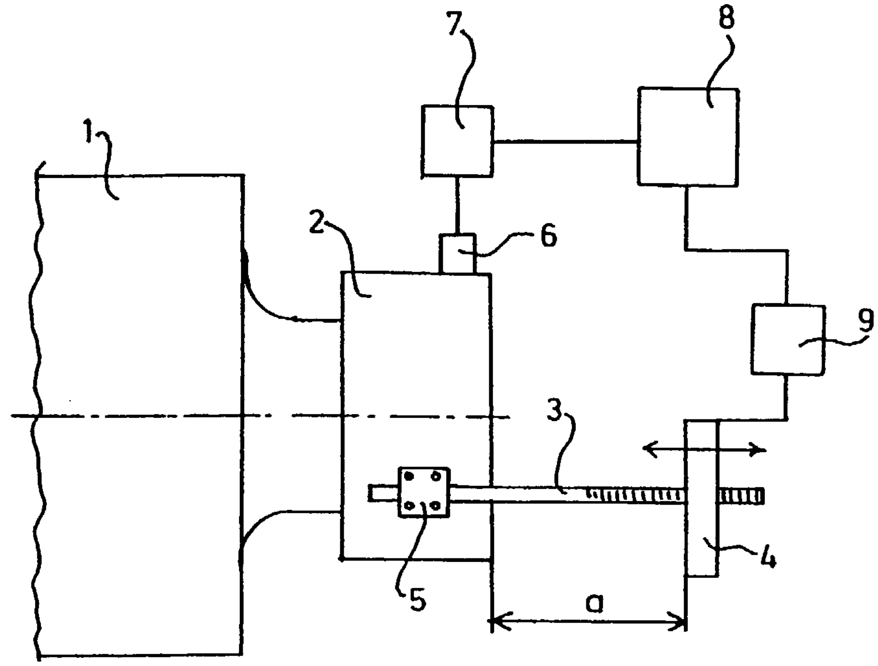


FIG. 1


7
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1
2
6
9
3
4
5
a

FIG. 2

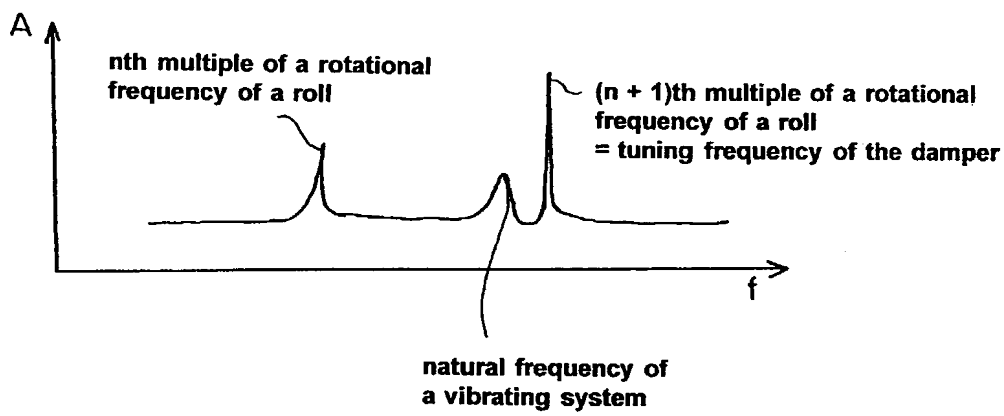
A
nth multiple of a rotational
frequency of a roll
(n + 1)th multiple of a rotational
frequency of a roll
= tuning frequency of the damper
f
natural frequency of
a vibrating system

FIG. 3

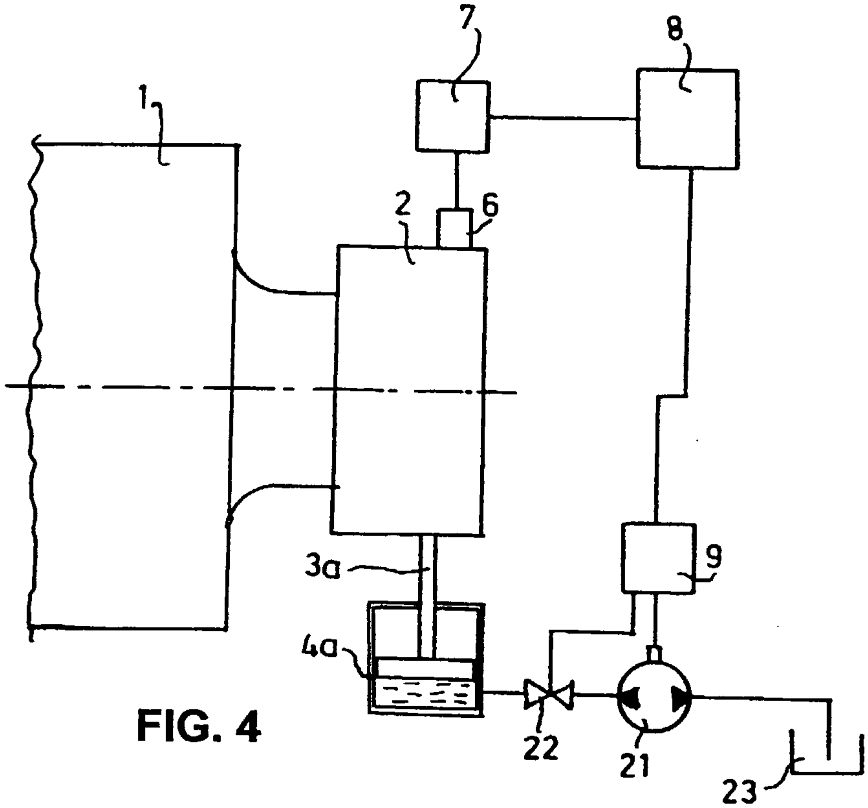

FIG. 4

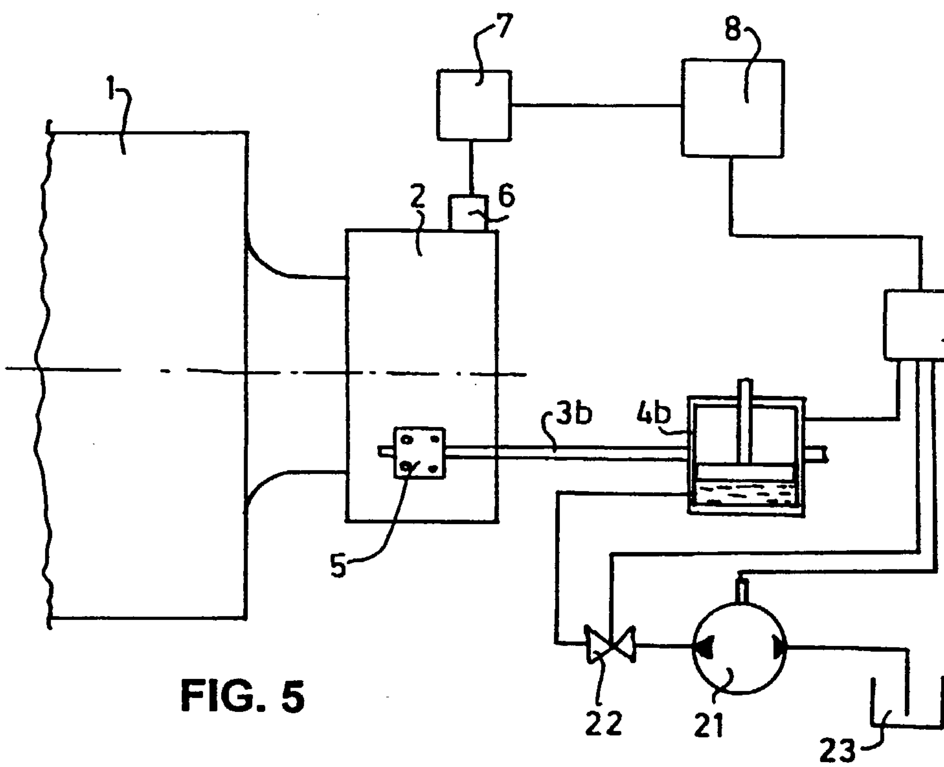

FIG. 5

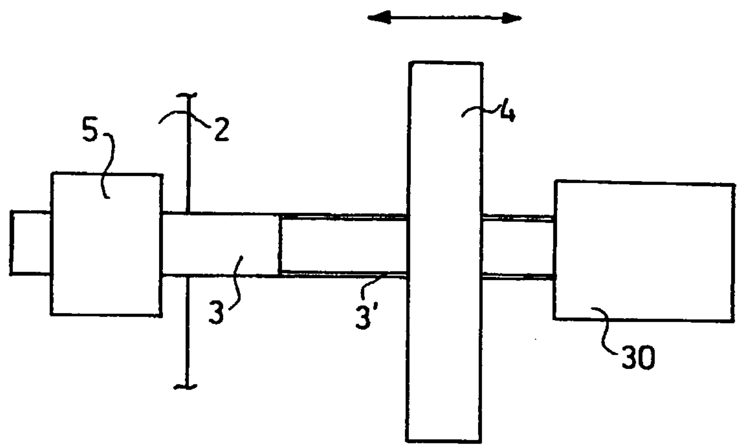

FIG. 6

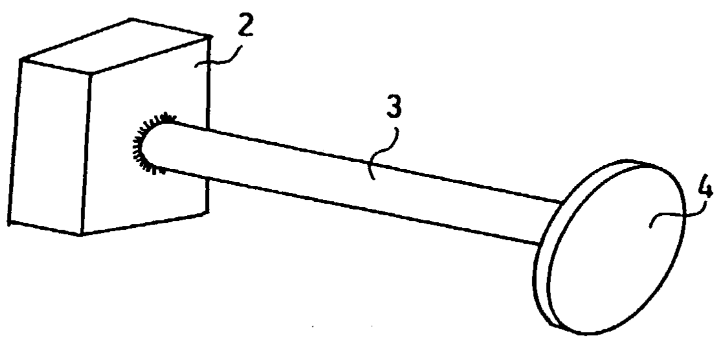

FIG. 8

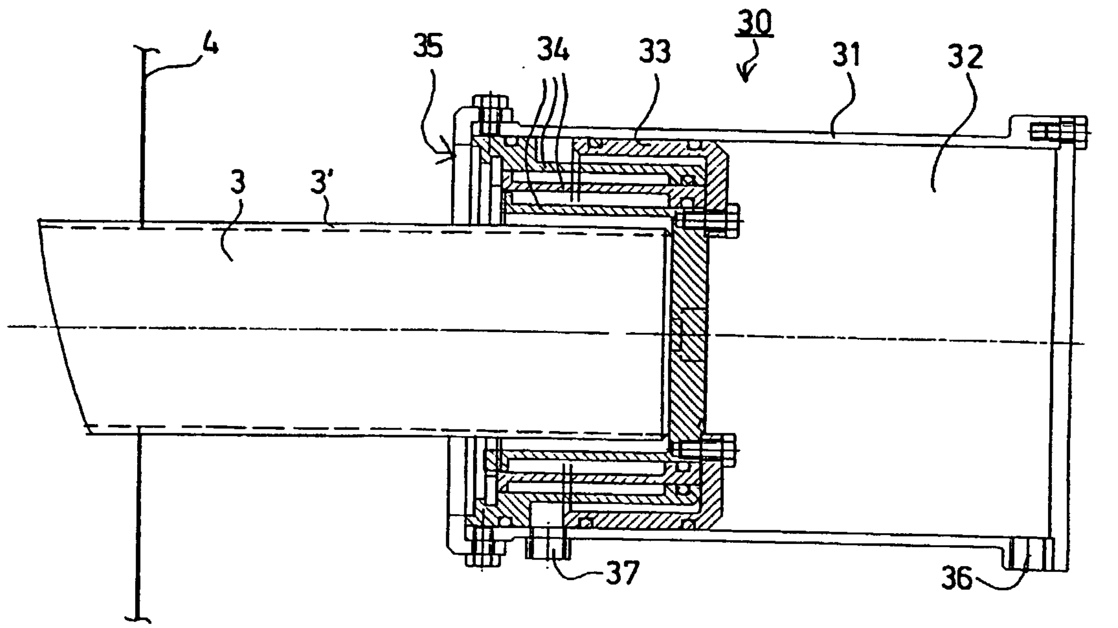

FIG. 7A

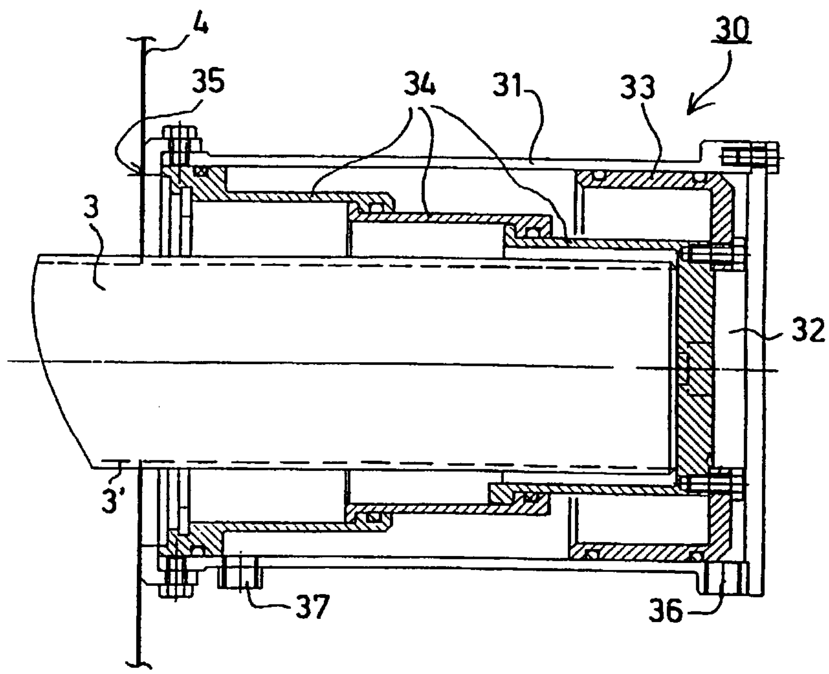

FIG. 7B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00355

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D21G 7/00, F16F 15/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F16F, D21G, F16C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DIALOG, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 4324595 C1 (SULZER-ESCHER WYSS GMBH), 15 December 1994 (15.12.94), column 1, line 48 - line 55; column 2, line 5 - line 21; column 2, line 41 - column 3, line 3, column 4, line 5 - line 35; figure 1-7, claims, abstract	1-7,11-16, 19,26,30
Y		8-10,27-29
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X	US 5096541 A (ANDREAS ARNHOLD ET AL), 17 March 1992 (17.03.92), column 1, line 7 - line 14; column 2, line 1 - line 15; column 3, line 31 - line 34, column 4, line 4-line 13; column 5,line 34-line 62; figure 4,7, claims, abstract	1-7,11-16, 19,21,24-26, 30
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 August 1998	24-08-1998
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Ulf Nyström Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 98/00355

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	US 5184703 A (WILHELM A. VAN ZEGGEREN ET AL), 9 February 1993 (09.02.93), column 5, line 27 - line 32; column 6, line 19 - line 27 --	8-10,27-29
P,X	EP 0819638 A2 (VOITH SULZER PAPIERMASCHINEN GMBH), 21 January 1998 (21.01.98), figure 7 --	1,11
A	US 3917246 A (JOSEPH R. GARTNER ET AL), 4 November 1975 (04.11.75) -- --------	1-30

INTERNATIONAL SEARCH REPORT

Information on patent family members

27/07/98

International application No.

PCT/FI 98/00355

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		SE 0417112 T3	
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		JP 10077143 A	24/03/98
US 3917246 A	04/11/75	NONE	

United States Patent [19]
Bollani BEST AVAILABLE COPY
[11] Patent Number: 4,464,986
[45] Date of Patent: Aug. 14, 1984

[54] DEVICE FOR REDUCING THE VIBRATION OF A PRESS SECTION CONSTITUTED BY TWO OR MORE ROLLS PRESSED ONE AGAINST THE OTHER IN A PAPER MANUFACTURING MACHINE

[75] Inventor: Umberto F. Bollani, Turin, Italy
[73] Assignee: Beloit Corporation, Beloit, Wis.

[21] Appl. No.: 401,738
[22] Filed: Jul. 26, 1982
[30] Foreign Application Priority Data
Jul. 31, 1981 [IT] Italy 68079 A/81
[51] Int. Cl.^{3} B30B 3/04
[52] U.S. Cl. .... 100/163 R; 100/169; 100/176; 162/358; 267/63 R; 267/141.1; 384/220
[58] Field of Search .... 100/162 R, 163 R, 168, 100/169, 170, 171, 176, 163 A; 162/358; 308/184 R; 384/215, 220; 267/136, 137, 141, 141.1, 63 R

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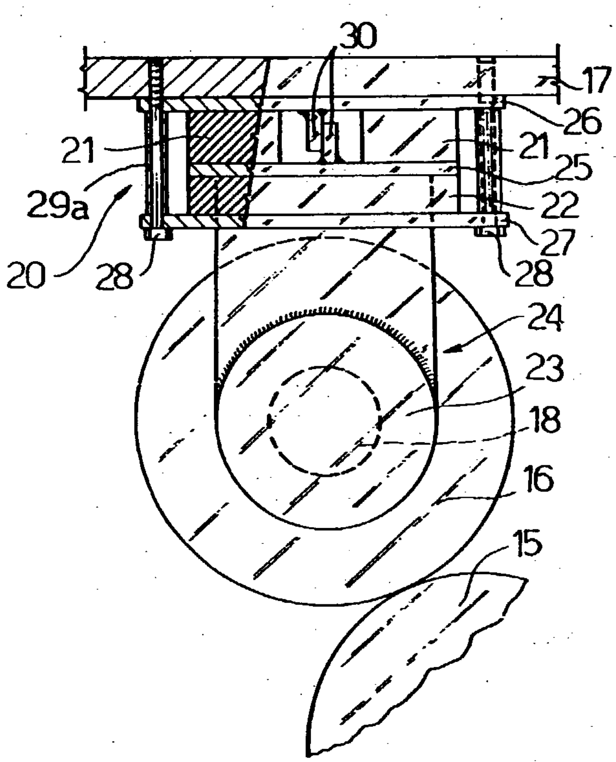
Primary Examiner—Peter Feldman
Attorney, Agent, or Firm—Hill, Van Santen, Steadman & Simpson

[57] ABSTRACT

A mechanism for a press section of a papermaking machine including a press having first and second press rolls forming a pressure loaded press nip therebetween with a support frame and end bearings for the first roll with a support carrying the end bearings on the frame including first and second layers of deformable elastic material with a plate connected to the bearing between the layers of material and plates on the outer surfaces of the layers connected to the frame so that vibrational forces normal to the direction of movement of the web through the nip are passed through the layers of elastic material.

4 Claims, 7 Drawing Figures



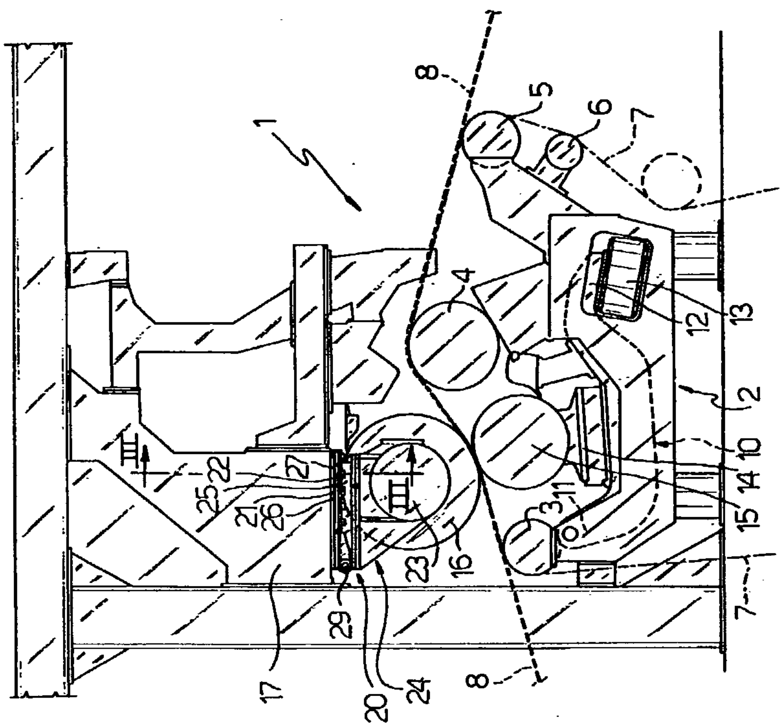


Fig. 1

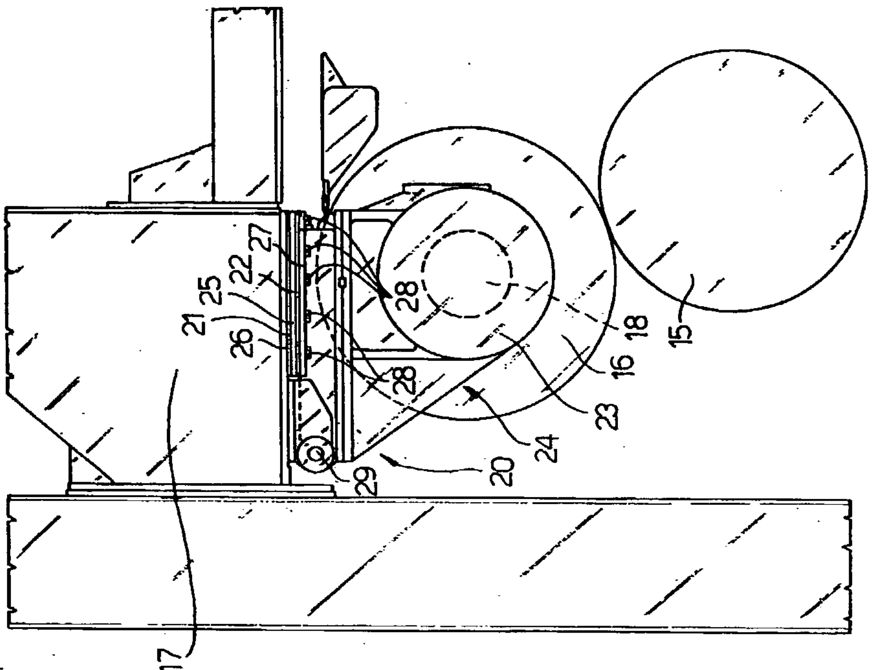

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Fig. 2

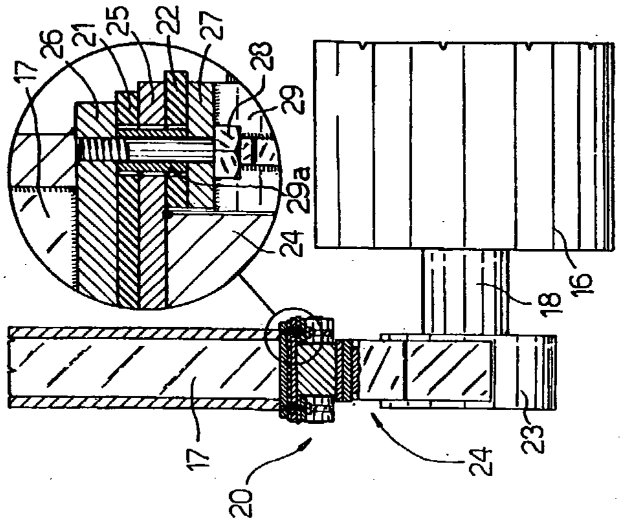
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Fig. 3

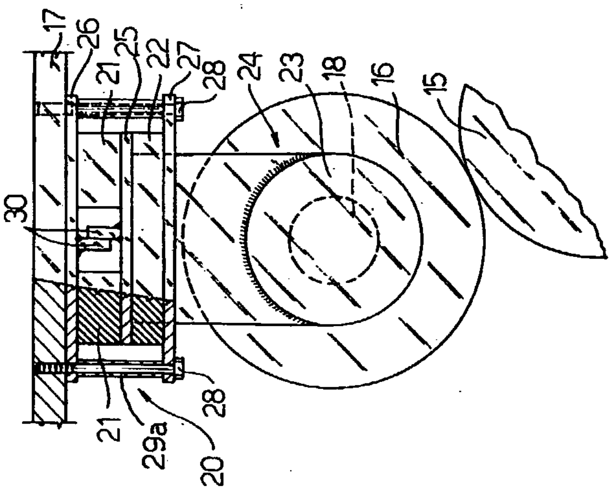

Fig.4

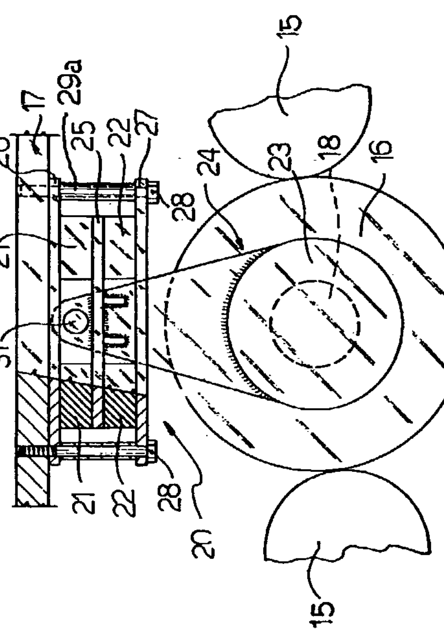

Fig.5

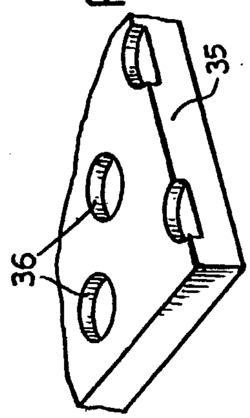

Fig.7

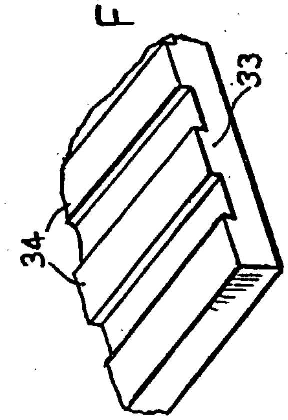

Fig.6

DEVICE FOR REDUCING THE VIBRATION OF A PRESS SECTION CONSTITUTED BY TWO OR MORE ROLLS PRESSED ONE AGAINST THE OTHER IN A PAPER MANUFACTURING MACHINE

BACKGROUND OF THE INVENTION

The invention relates to improvements in papermaking machines, and more particularly to improvements in press sections and to an arrangement for reducing the vibration which occurs between two or more press rolls loaded to form a press nip for dewatering a traveling web of paper.

In papermaking machines, the web of paper is made continuously by depositing a slurry of fibers of wood or other vegetable substances with the addition of additives onto a traveling foraminous wire in order to form a layer which is dewatered through the wire and subsequently pressed and dried to form a continuous paper web or sheet. During this operation, the web formed on the wire is transferred, usually with one or two water absorbing felts between the succession of pairs of press rolls. A typical press roll will have opposed rolls pressure loaded against each other with one of granite and one of steel, although other materials may be used, which are pressed one against the other with considerable force to press water from the paper web and force it into the felt.

In the pressing operation the rolls necessarily operate at the high speeds of the machine and are subject to persistent vibration which leads to nonuniformity in the paper web and in the felt. Because the rolls are pressed together with substantial pressure, vibrations create minute variations in this pressure which translate into differences in water extraction, and the sheet produced, therefore, is not perfectly uniform and regular. Also, because of the high rotational speed of the rolls, load noise is produced, and in some instances the vibration will cause damage to the rolls and support members and other component parts.

It is accordingly an object of the present invention to provide a mechanism for satisfactorily reducing the vibration of press rolls in a papermaking machine which eliminates the disadvantages referred to and which inherently accompany vibration.

A further object of the invention is to provide an improved vibration absorbing or preventing mechanism of simplified construction for a paper press in a papermaking machine which has the operating life of the press and which does not require repair or attention during its operating life.

In accordance with the principles of the invention, the device contemplates the provision of a paper machine press with a pair of rolls forming a press nip with each of the rolls being supported by a pair of bearings fixed to the frame of the assembly for supporting the rolls. At least one of the rolls is provided with a vibration absorbing mechanism which includes a pair of layers of deformable elastic material disposed between the bearings and the frame. One of the layers is disposed so that it deforms by compression when the movement of the bearing is induced by vibration in a first direction, and the other layer is disposed in such position that it deforms by compression when the movement of the bearing takes place in the opposite direction.

Other advantages, features and objects will become more apparent with the teaching of the principles of the invention in connection with the disclosure of the preferred embodiments thereof in the specification, claims and drawings, in which:

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of a press section in a papermaking machine showing the ends of rolls of the press, and constructed and operating in accordance with the principles of the invention;

FIG. 2 is an enlarged front view of one embodiment of the invention with parts omitted for clarity, as compared with FIG. 1;

FIG. 3 is a fragmentary view, taken partially in section, substantially along line III—III of FIG. 1 with a fragmentary portion illustrated within the circle showing details of construction;

FIGS. 4 and 5 are fragmentary views, shown partially in section, of two additional embodiments of the mechanism; and

FIGS. 6 and 7 are fragmentary perspective views of resilient pads of alternate construction.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in FIGS. 1–3, FIG. 1 illustrates overall a press for a papermaking machine having an upper frame 2 with supports for rolls shown at 3, 4, 5 and 6. An endless felt 7 carries a web 8 through the nip between press rolls 15 and 16. The press 1 also includes a lever arm 10 housed in the frame 2 and being constructed substantially of U-shaped cross-section. A first end 11 of the lever 10 is hinged to the frame, and the other end 12 rests on a hydraulic cylinder 13. Two support elements 14 rest on an intermediate portion of the lever arm 10, and by means of suitable bearings, not shown in detail, the support elements 14 support the ends of a shaft which carries the roll 15. The roll 15 is normally of steel or cast iron and has a suitable outer coating layer and is pressed by the action of the lever 10 against the roll 16. The roll 16 is usually of granite or other coated material and is supported and carried on an upper frame member 17. The force exerted by the roll 15 on the roll 16 and thus on the felt 7 and on the web 8 is obtained by the force produced by the hydraulic or pneumatic cylinder 13 so that water is expressed from the web into the felt as the two travel together through the nip between rolls 15 and 16. As the rolls rotate, either by being provided with drive means, not shown, or due to contact with the web and felt, vibrations tend to be induced which are absorbed and reduced or eliminated by the vibration eliminating mechanism indicated at 20, and by absorbing the vibration of the upper rolls, the device will also tend to absorb the vibrations of the lower roll.

The particular embodiment of the device includes resilient vibration absorbing members which absorb the vibration of the rolls in a direction normal to the path of travel of the web through the nip. The vibration absorbing members are part of a support carrying the bearings for the upper roll on the frame member 17 and the support is arranged so that displacement in the direction parallel to the path of travel of the web is prevented by nonyieldable portion of the support. The vibration absorbing device includes a pair of layers of deformable elastic material 21 and 22, FIG. 3, which are disposed between each of the end roll bearings 23 and the press frame 17. One of the layers is disposed in a position such

that it deforms by compression when the movement of the bearing 23 induced by vibration takes place in a first direction and the other layer is disposed in a position such that it deforms by compression when the movement of the bearing induced by vibration takes place in a second direction which is opposite the first. The direction of vibration which is absorbed is along a straight line normal to the direction of web travel or, in other words, essentially along a straight line which is normal to the surfaces of the two rolls at the nip or in other words, along a line passing through the axial centers of the rolls.

The construction of the mechanism is shown in FIGS. 1-3 and includes a plate 25 which is rigidly connected to the bearing 23 by a bearing bracket member 24. The layers of material 21 and 22 are disposed on opposite sides of said plate 25, and also disposed between an upper plate 26 and a lower plate 27 rigid with the frame 17. The upper plate 26 is suitably secured to the frame, and the lower plate 27 is made rigid with the frame by utilizing bolts 28 with their heads secured to the lower plate and the upper ends threaded into the rigid plate 26 which is rigid with the frame. The plate 25, however, has holes therethrough which permit it to move up and down relative to the bolts 28. A suitable loose bushing 29a surrounds the bolts, and as the bolt 28 is tightened, the bushing 29a is pulled tight between the plates 26 and 27.

Between the bearing 23 and the frame 17, the support includes a mechanical locking member which permits movement in the direction normal to the nip in order to absorb the vibration, but which permits no movement in the direction parallel to the nip. In the arrangement of FIGS. 1-3, this locking member which is part of the support consists of a hinge 29, FIGS. 1 and 2, positioned between the support member 24 and the frame 17. The hinge allows the bearings to move up and down as shown in the drawings, but not laterally.

In the arrangement of FIG. 4, the mechanical locking member which is part of the support is shown as a pair of tongues 30, one of which is attached to the rigid upper plate 26, and the other which is attached to the plate 25 movable with the bearing. An opening is provided through the pad 21 to accommodate these tongues, and the tongues have vertical sliding surfaces permitting up and down movement, but preventing lateral movement. The mechanical locking member, shown as tongues 30 in FIG. 4, and as a hinge 29 in FIG. 1, while shown in the preferred forms, may include other forms of structure such as a resilient arm or connecting rod, not shown, disposed between the frame and oscillating plate 25.

In the structure of FIG. 5, the support member 24 is swivel or swing mounted and is hinged by an overhead pintel pin. The plate 25 is rigid with the support member 24. For use of this arrangement, the pressing nip structure includes two opposed rolls 15 positioned on laterally opposite sides of the roll 16 so as to form two separate nips through which the web and felt pass for the pressing operation.

During the pressing operation, vibration arises which causes the roll 16 to undergo movements in a direction which is normal to the nip, or in other words, normal to the path of travel of the web through the nip. These vibration movements are substantially vertical in the construction of FIG. 1. When the vibration induces movement in an upward direction, the upper pad or layer 21 is deformed by compression and stores the kinetic energy generated by the vibration thus preventing this from being transmitted to the frame 17. Because of the nature of the materials of the layers 21 and 22, these are able to act effectively as shock absorbers. When the direction of movement induced by the vibration is reversed, the lower layer 21 compresses in the same manner. The pads 21 and 22 may be of various materials which have deformable elastic qualities such as rubber.

The operation of the device and the embodiments shown in FIG. 5 is similar to that described inasmuch as the layers 21 and 22 operate alternately by compression as a result of the rocking of the support 24 about the hinge pin 31 induced by vibration.

The presence of the mechanical locking members, the hinge 29, or the tongues 30, or the hinge pin 31 between the rolls prevent the components of the force which are directed along the plane of the travel of the web, from being able to act directly on the pads 21 and 22 which would not be able to support such movements. This permits the pads 21 and 22 to be designed for optimum vertical vibration absorption and are not required to be designed for lateral movement.

The layers or pads 21 and 22 can be of any deformable elastic material such as rubber, elastomer, plastics or the like. Conveniently, each of the layers can be constructed by superimposing a plurality of sheets of the material on each other and disposing a metal plate between two adjacent sheets.

In one form, the deformability of the assembly can be increased such as by providing the surface of the pads with grooves in the manner shown in FIG. 6 wherein a pad 33 has ribs 34 on the surface. In another construction, as illustrated in FIG. 7, a pad 35 has a series of depressions 36 on the surface. Such ribs 34 or depressions 36 may be on one or both surfaces of the pads depending upon the physical characteristic desired.

Thus, I have provided an improved press mechanism for a papermaking machine which provides the objectives and advantages above set forth, and it will be understood that other equivalent structures and methods may be employed within the spirit and scope of the invention.

I claim as my invention:

1. A mechanism for a press section of a papermaking machine comprising in combination:

first and second press rolls forming a pressure loaded press nip therebetween for receiving a traveling web moving in a machine direction;

a support frame for the rolls;

bearings for said rolls including end bearings for the first roll;

a support carrying said end bearings on the frame including a first layer of deformable elastic material between the end bearings and the frame and positioned to deform with movements of the first roll in a first direction toward the frame at right angles to the axis of the roll;

including a second layer of deformable elastic material located between said end bearings and the frame and positioned to deform with movement of the first roll in the second direction opposite the first direction away from the frame;

and said connection including a pair of parallel tongues having sliding engaging surfaces extending parallel to said first and second directions and accommodating movement of the end bearings in said first and second directions, said surfaces being non-

movable toward each other in the machine direction.

2. A mechanism for a press section of a papermaking machine comprising in combination:

first and second press rolls forming a pressure loaded press nip therebetween for receiving a traveling web moving in a machine direction;

a support frame for the rolls;

bearings for said rolls including end bearings for the first roll;

a support carrying said end bearings on the frame including a first layer of deformable elastic material between the end bearings and the frame and positioned to deform with movements of the first roll in a first direction toward the frame at right angles to the axis of the roll;

including a second layer of deformable elastic material located between said end bearings and the frame and positioned to deform with movement of the first roll in the second direction opposite the first direction away from the frame;

and the support including a first plate secured to the end bearing by a first member connected to the center of the plate and a second plate secured to the frame with said layers of elastic material on opposite sides of said first plate and on both lateral sides of said member, the first layer being between said first and second plates, and a third plate secured to the second plate by second members and located on the opposite side of said second elastic material layer relative to said first plate, said second members located laterally outwardly of the elastic material so that the elastic material is located between said first and second members.

3. A mechanism for a press section of a papermaking machine comprising in combination:

first and second press rolls forming a pressure loaded press nip therebetween for receiving a traveling web moving in a machine direction;

a support frame for the rolls;

bearings for said rolls including end bearings for the first roll;

a support carrying said end bearings on the frame including a first layer of deformable elastic material between the end bearings and the frame and positioned to deform with movements of the first roll in a first direction toward the frame at right angles to the axis of the roll;

including a second layer of deformable elastic material located between said end bearings and the frame and positioned to deform with movement of the first roll in the second direction opposite the first direction away from the frame;

and said layers of deformable elastic material having spaced projections on the surface with plates in contact with the spaced projections and said plates connected to the frame and bearing respectively.

4. A mechanism for a press section of a papermaking machine comprising in combination:

first and second press rolls forming a pressure loaded press nip therebetween for receiving a traveling web moving in a machine direction;

a support frame for the rolls;

bearings for said rolls including end bearings for the first roll;

a support carrying said end bearings on the frame including a first layer of deformable elastic material between the end bearings and the frame and positioned to deform with movements of the first roll in a first direction toward the frame at right angles to the axis of the roll;

including a second layer of deformable elastic material located between said end bearings and the frame and positioned to deform with movement of the first roll in the second direction opposite the first direction away from the frame;

said layers of deformable elastic material having openings therethrough with plates in contact with the surfaces of the elastic material and said plates connected to the frame and bearing respectively.

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